Physics 106a **General Information** **Fall 2000**

Lecturer: Prof. Fiona Harrison 211 Downs x6601 fiona@srl.caltech.edu

Location: Tuesday/Thursday 1:00 – 2:30, 107 Downs

Office Hours: I will be available for questions Wednesdays, 3:00 – 4:00 and by appointment (e-mail to arrange a time). The TA's will also hold office hours to provide support for questions on homework.

Teaching Assistants: Yanbei Chen (yanbei@its.caltech.edu) 156 W. Bridge
Office Hours: 8:00 – 9:30 p.m. Wednesday
Yi Li (ylm@its.caltech.edu) 335 Lauritsen (office hours only)
Office Hours: 8:30 – 10:00 p.m. Tuesday
Federico Spedalieri (federico@its.caltech.edu) 250 Lauritsen
Office Hours: 3:00 – 5:00 p.m. Monday

Course Description/Text:
Physics 106 (abc) covers intermediate level classical mechanics and electricity and magnetism. Roughly half the year will be devoted to each. The textbooks for the class are Hand and Finch, *Analytical Mechanics* and Jackson, *Classical Electrodynamics*. Neither will be completely covered. The mechanics textbook is new to Caltech this year. I chose it as a more modern alternative to Goldstein, which is now quite out of date (for example Chaos is not treated at all). Like Goldstein, it is at a relatively advanced level. Depending on your preparation and level of mathematical sophistication, you may wish to supplement your reading with less-detailed intermediate textbooks with more examples, or alternate advanced texts. As good intermediate level texts I recommend Marion, *Classical Dynamics*, and Symon, *Mechanics.* For alternative physical insights and more sophisticated mathematical treatments of selected subjects, Goldstein, Landau and Lifshitz, *Mechanics* and Scheck, *Mechanics* are good supplements. These will be placed on reserve in Millikan, and I have ordered copies of Goldstein for you to purchase, should you desire (it is *not* required).

I will be covering some subject matter not in the textbook. I will make copies of my class notes available to you in 203 Downs.

Assignments/Grades: Your grade will be based on **hw (30%), midterm (30%) and final (40%).** Homework will be assigned each Thursday, ***due the following Thursday***. Late homework will be accepted for 50% credit for up to 1 week (no credit for assignments more than 1 week late). You may arrange extensions with me or a TA ***in advance*** of the due date**.** ***Mark clearly on your paper who granted you the extension***. Graded papers will be returned within one week. Copies of assignments will also be available at http://www.srl.caltech.edu/phys106. You may collaborate (and are encouraged to do so) on solving homework problems, and you may get help from me or the from TAs. The writeup of the problems must be your own ***(no "handwritten Xeroxs" of someone else's work!).***

The 2-hour midterm will be passed out **Oct. 26, due Oct. 31**. No collaboration or discussion on any aspect of the midterm with any other student is allowed. You may refer to *your own* hand-written notes, not mine, and not your textbook. The 3-hour final will also be take-home, no collaboration allowed.

SYNOPSIS – Physics 106A – Prof. Harrison 2000/2001

The following summarizes the approximate schedule we will follow Fall term. Note that the dates may be modified slightly depending on how things evolve.

1. **9/11 – 9/29 Newton's Laws** Material: Review
   Inertial frames, conservation laws, elastic collisions

2. **10/2 – 10/6 The Lagrangian Formulation of Mechanics** Material: H&F Chap. 1, 2
   Calculus of variations, Euler equations, Lagrangian formulation of mechanics, Hamilton's Principle, holonomic constraints, D'Alembert's Principle, generalized forces, path integrals

3. **10/9 – 10/13 Applications of Lagrangian Dynamics** Material: H&F Chap. 1, 2
   Conservation laws, simple and double pendula, elliptic functions, parametric oscillator, non-holonomic constraints

4. **10/16 – 10/24 Central Force Motion** Material: H&F Chap. 4
   Effective potentials, closed orbits, Kepler problem, Rutherford scattering, Runge-Lenz vector, perturbations, perihelion advance of Mercury, solar oblateness, virial theorem.

5. **10/26 - 10/31 Linear Oscillations** Material: H&F Chap. 3
   Stable/unstable equilibrium, simple harmonic motion, damping

6. **11/2 – 11/7 Theory of Small Oscillations** Material: H&F Chap. 9
   Normal modes, friction and damping, diatomic and triatomic molecules

6. **11/9 – 11/14 Rotating Coordinate Systems** Material: H&F Chap. 7
   Infinitesimal rotations, rotating reference frames, angular velocity, fictitious forces

7. **11/16 – 11/21 Rigid Body Dymanics** Material: H&F Chap. 8
   Inertia tensor, angular momentum, kinematics, equations of motion, Euler equations

8. **11/28 – 11/30 Precession** Material: H&F Chap. 8
   Force-free precession, Chandler wobble, symmetric top, nutation, sleeping tops, precession of the equinoxes, orbital precession, Foucault pendulum

9. **11/30 Review**